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Space Generation Fusion Forum

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Thank you for giving me this opportunity to join you for this first-ever Space Generation Fusion Forum. I was happy to accept your kind invitation to spend my Sunday with you – who we are counting on to fulfill our hopes and dreams for space activities. Our future will soon be in your hands and I'm here to outline what a bright future I believe it will be – especially with all of your involvement. This forum is proof that the growing trend towards international cooperation in space exploration and development have the ability to not only expand humankind's understanding of the universe -- it is also a powerful way for disparate nations and cultures to come together to advance peaceful cooperation on Earth. I want to especially welcome and congratulate the 12 international university students and young professionals who are winners of this year's Space Generation Fusion Forum Global Grants. Whether you are from established space sector economies like Canada and France or from developing countries like

Afghanistan and Indonesia, I want to salute your commitment to global cooperation in space development and exploration.

Fifty-one years ago this week, it was a Russian, Yuri Gagarin, who became the first human to orbit the Earth. America's historic 1969 Moon landing was fueled by the sweat and dreams of generations of astronomers and scientists, from the brilliant Italian Galileo to the brilliant German, Dr. Wernher von Braun and his team of rocket scientists. On the anniversary of Gagarin's flight last week, Charlie Bolden presented an address to the United Nations. He stated that "there is something intrinsically unifying about humankind's exploration of the heavens. Beyond the scientific and economic benefits of launching into space – of literally leaving this planet – I can tell you that when viewed from orbit, our borderless Earth inspires a sense of humility, unity of humanity and wonder. As the great British astronomer Sir Fred Hoyle said in 1948, "Once a photograph of the Earth, taken from outside, is available, a new idea as powerful as any in history will be let loose." How true".

Given this amazing history AND where we stand today with our international cooperative space programs, isn't it likely that our successes of the future will be fueled by the sweat and dreams of teams from

Afghanistan and Indonesia? And how will these partnerships in turn, help usher in an era of global stability and economic prosperity for the benefit of humanity?

Again, I'll quote from Charlie's UN speech last week, "I believe that the success of our modern space programs will be judged, in part, on how well we continue to make space exploration about global partnership. Particularly since it is clear that no one nation can do it alone and the benefits to be gained are for all humanity."

Today we are meeting on one of the most dreaded but important days of the year here in this country. April 15th is tax deadline day in America. And while that may not seem to have much to do with our discussions about space exploration, it's actually quite relevant since the two government sponsors of this event – FAA and NASA rely on tax dollars for our existence. And our budget proposals for 2013 have just been announced.

As we at NASA work to secure the $17.7 billion budget that President Obama has put forth, we are under increased pressure to justify America's space program in light of so many other pressing world problems here on the Earth. I, for one, welcome the opportunity. It is a special privilege to carry out the public trust and with that trust, comes responsibility. Our

government investments in space should always contribute to the general welfare and security of the United States (as mandated in the 1958 NASA Space Act). The Act declares our policy and purpose which include (in this order):

1) Devotion of space activities to peaceful purposes for the benefit of all humankind

2) For the welfare and security of the united states

3) To seek and encourage, to the maximum extent possible, the fullest commercial use of space

4) Contribute materially to one or more of the following objectives: expansion of human knowledge of the earth and space; improve the usefulness, speed, performance, safety and efficiency of aeronautical and space vehicles; develop and operate vehicles capable of carrying instruments, equipment, supplies, and living organisms through space; study the potential benefits to be gained from these investments; preserve the role of the US as a leader in these technologies and in the application thereof; make information available to other US agencies; (**Cooperation by the United States

with other nations and groups of nations in work done pursuant to this chapter and in the peaceful application of the results thereof); utilize the resources of other US national agencies; preserve the preeminent position of the US through research and technology development related to associated manufacturing processes.

5) Ground Propulsion Systems Research and Development

6) Bioengineering Research

7) Warning and Mitigation of Potential Hazards of Near Earth Objects.

These last three purposes are all followed by the statement “Congress declares that the general welfare of the United States requires that the unique competence of the Administration be directed toward…

So the fact is, that NASA was specifically FOUNDED to play an indispensable role in improving the general welfare of society and in advancing our economic and national security. So our challenge is merely to best align our programs with those goals, and to explain that to Congress and the American people. That shouldn’t be too hard right? Well, for many reasons, we are finding it a bit challenging. As you may have heard, last year, the President’s NASA budget request was cut nearly

$1B by Congress. And this year, the very programs which best align to these founding NASA purposes are not being fully supported by many of our (traditionally) strongest allies. I'd like to challenge you today to help us evaluate how our space activities can better align with these critically important objectives, so that our efforts, and space activities around the globe can more effectively address these purposes. An added challenge, if you are so inclined, is to help us better communicate how our activities contribute to solving these global challenges and benefit humanity.

At this Forum, you will get a chance to explore in depth some of the benefits of space exploration and development in the three panels taking place tomorrow on International Collaboration, Developing Regions and Space Applications and the new role of commercial industry partners in space flight. I just want to take a few minutes this afternoon to share some of my thoughts in each of these areas.

International Collaboration

First, as most of you know, NASA has a long history of international cooperation across a wide variety of space activities. (as I highlighted in the NASA Administrator's UN remarks…) and the fact that, "cooperation with other nations and groups of nations" in the peaceful exploration of space is

a key purpose of the Space Act of1958. While we are proud of NASA's global leadership, we are also mindful that the scientific and human space flight achievements of the past half century would not have been possible without international collaboration (even if that is sometimes spurring competition). While the Cold War rivalries that once existed have changed, the geopolitical world order continues to drive space investments. President Obama has made space activities key elements of America's commitment to building a more peaceful world. In his speech at the Kennedy Space Center two years ago, he said, "No longer are we racing against an adversary; in fact, what was once a global competition has long since become a global collaboration."

Since NASA's founding 52 years ago, international cooperation has been one of our cornerstones. We have entered into about 4000 agreements in that time with more than 120 nations, touching almost every aspect of NASA's activities.

Right now NASA has 535 active international agreements, conducting some form of ground-based or space-based research linked to every continent and working with nations around the world to develop and implement the next generation of space exploration missions. Perhaps the

most visible example of that cooperation is the International Space Station (ISS).

In addition to all the science and research on human health that has been and continues to be conducted on the ISS, one of the Station's historic achievements is how it demonstrates that many nations can work together on a project of enormous scope, complete it and then keep it going. Fifteen nations contributed to the development and assembly of the ISS and even more are or will soon become involved in the program through their utilization of this amazing orbiting research facility.

Developing Regions and Space Applications

Second, space exploration is playing a big role in helping the entire world -- especially developing regions -- better cope with environmental, energy and health challenges that affect us all. I could spend the rest of the day talking about the many ways space technology has improved life here on Earth – from the development of life saving vaccines to the efforts now underway by NASA and the FAA to make commercial airline transportation safer, quieter and more energy efficient. Let me highlight a few recent developments.

One year ago, NASA signed a five-year memorandum of understanding with USAID creating NASA's SERVIR program which integrates satellite observations, ground-based data, and forecast models to monitor and forecast environmental changes and improve response to natural disasters in Central America, the Caribbean, Africa and the Himalayas. This effort is helping inform decision making in the areas of climate change, health, environment, agriculture, water and weather.

NASA's Earth Applications programs promote and fund activities that discover and demonstrate innovative uses and practical benefits of NASA's Earth science resources. NASA is partnering with public and private organizations to apply NASA scientific findings and Earth observing data to decision-making activities. Examples include Ecological Forecasting…utilizing data gathered by the Terra and Aqua satellites to model water prediction and tracking for use by water resource managers to help determine how much and when, water should be diverted for public use.

And on March 22nd of this year – World Water Day -- I joined U.S. Secretary of State Hillary Clinton in launching the U.S. Water Partnership, a new public-private partnership that seeks to mobilize U.S. based

knowledge, expertise and resources to improve water security around the world, particularly in those countries most in need. Did you know that there are over one billion people on this planet without immediate access to clean water? In just one day, women and girls around the world devote 200 million work hours collecting water for their families. NASA's Earth observation research capabilities in space are contributing to new knowledge to tackle the global water challenge.

Commercial Space Transportation

Finally, a word about NASA's commitment to commercial space transportation. At NASA, we believe that commercial space transportation is vital to the future of human space exploration and to the strengthening of the American economy. As we chart a new course to send humans deeper into space than ever before, we are stimulating innovation within the private sector to develop and operate safe, reliable and affordable commercial space transportation systems.

We are committed to ensuring that American companies, launching from U.S. soil, transport our astronauts and their cargo to the International Space Station and other low Earth orbit destinations. In calendar year, 2012, we will see the first commercial flights to the International Space

Station and we are on track to have American companies transporting our astronauts to Station by 2017, ending the outsourcing of this work and creating good paying jobs here in the United States. This approach will provide assured access to the station, strengthen America's space industry, and provide a catalyst for future business ventures to capitalize on affordable access to space.

On April 30, Space X is expected to launch its Dragon spacecraft atop its Falcon 9 launch vehicle to test and prove its systems for a rendezvous with the space station. Later in the year, Orbital Sciences will also launch to the station. And NASA recently issued an announcement for proposals for the next round of commercial crew acquisition activities. But what does this capability enable? Let's review: Certainly reliable, redundant access to the ISS (our national laboratory and our toe-hold for space exploration), is our first and foremost goal. But everything we do in space will be advanced by more affordable and efficient space access: more satellites for Ecological forecasting, water resource management, disaster prediction and response, solar storm prediction, planetary exploration, asteroid detection, unlocking the mysteries of the universe, answering the question, "are we alone?", keeping our troops safer by providing better communications and

positioning information, and increasing our economic security by re-entering the commercial launch market (a billion dollar a year market) which we have nearly completely lost in the past 15 years.

I want to leave you with one final thought: America stands ready to continue to lead this next era of space and Earth science, exploration and development. We will continue to deliver on the Promise of the 1958 Space Act and we welcome the support and participation of our international partners, including all of you, in achieving these ambitious goals.

As I've said, NASA's vision is to reach for new heights and reveal the unknown so that what we do and learn will benefit all humankind. Space exploration, development and utilization strengthens us all, not only with the new discoveries we make, but with the many technologies that are developed to improve life on Earth. And it advances the human condition, as well as the human spirit, bringing us closer together as one world.

So as I stated at the beginning of my talk, I believe the future is bright. To make my final case to convince you, I've created one of my famous "Top Ten lists"… these are the:

Top Ten reasons to make space your career choice:

#10 – over 50% of economic growth is attributed to technological change – space is at the absolute cutting edge of making technological change and stands to benefit global economic security more than any other investment.

R&D investments (like NASA and other government space agencies) create entire new industries (ARPA-NET – led to internet, NASA and other space agency investments led to the communications satellite industry, remote sensing, GPS)

#9 -- This industry has unlimited growth potential… The limitless possibilities for new industries with positive rates of return are unmatched. Last year in the US alone, the space industry exported billions of dollars. Conservative estimates of private rate of return of R&D range from 20 – 30%. Conservative estimates of social rate of return of R&D range from 35 – 50%... (and speaking of social benefits…)

#8 - Space assets and investments allow us to improve and save thousands of lives through a myriad of activities such as: instantaneous communications, disaster monitoring, ecological forecasting, water

resource management, disease mitigation, solar radiation prediction and climate and weather monitoring.

#7 – We actually really need you. You may have noticed, we could desperately use the next infusion of the world's emerging top talent to replace our fabulous, but aging and (somewhat set in our ways) workforce and leadership… (believe me, you will be able to compete for jobs in this industry)

#6 – It is through space research that we will solve the really big questions for humanity: Where did life begin? Where are we going? Are we alone?

#5 – Great pick-up line at parties…"what do you do?" .. "I work in the space program"… There is absolutely NOTHING cooler.

#4 – Do you really want humans to be a single planet species? You do remember what happened to the dinosaurs, right?

#3 – that many billionaires can't be wrong? (Bezos, Musk, Paul Allen, Paige, Brinn, Schmitt, Carmak). The joke is that the best way to become a millionaire in space is to start as a billionaire, but they are clearly onto something…

#2 – the National Space Symposium…seriously, the Broadmoor? Where else can you gather every year (on an expense account) at a 5 star resort with your best friends, and thousands of other brilliant people, working to make the world a better place?

#1 – space activities promise to deliver the most meaningful, positive advancements for human society, and we need your knowledge and innovative spirit to force us and focus us on delivering this promise.

Thank you for recognizing the value of space activities by joining us here today and I appreciate you asking me to speak.